ALBERT

Name _____ Date _____

Congruence and Rigid Motions Worksheet

Geometry · Common Core HSG-CO.B.6

> Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

Practice

Builds the skill step by step.

1. When are two figures congruent?
   A. When they have the same number of sides
   B. When one is a dilation of the other
   C. When a sequence of rigid motions carries one onto the other
   D. When they have the same area

2. Triangle ABC is translated to triangle A′B′C′. AB = 5. What is A′B′?

3. A triangle has a 40° angle at A. The triangle is rotated, and A goes to A′. What is the measure of the angle at A′?

4. Which transformation can map a figure to one that is NOT congruent to it?
   A. a dilation with scale factor 2
   B. a translation
   C. a reflection
   D. a rotation

5. A square with side length 6 is reflected across a line. What is the perimeter of the image?

6. Figure F is reflected across a line and then rotated 90°. How is the final image related to F?

   A. It is unrelated.

   B. It is larger than F.

   C. It is similar but not congruent.

   D. It is congruent to F.

7. Segment AB goes from A(1, 2) to B(4, 6). It is translated by $(x, y) \to (x - 3, y + 1)$. How long is the image segment?

8. A triangle with area 18 square units is rotated 90°. What is the area of the image?

9. Two segments each have length 7. Are they congruent?

   A. No. They are in different places.

   B. Yes. A rigid motion can carry one onto the other.

   C. Only if they are parallel.

   D. Only if they share an endpoint.

10. A rigid motion maps angle P, which measures 65°, onto angle P′. What is the measure of angle P′?

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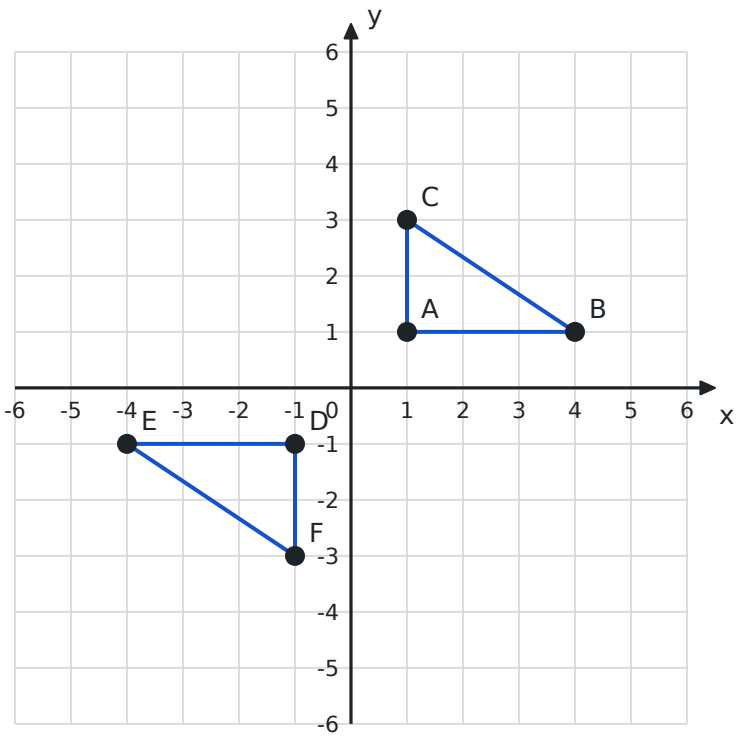
On Level

Grade-level practice.

1. Triangle ABC has vertices A(1, 1), B(4, 1), C(1, 3). Triangle DEF has vertices D(−1, −1), E(−4, −1), F(−1, −3). Which is true?



A. They are congruent, because a translation maps ABC onto DEF.

B. They are congruent, because a 180° rotation about the origin maps ABC onto DEF.

C. They are not congruent, because their orientations differ.

D. They are not congruent, because they are in different places.

2. A 3-by-5 rectangle lies flat. A second 3-by-5 rectangle stands on its short side. Are they congruent?

   A. Yes. A 90° rotation (and a translation) carries one onto the other.

   B. No. One is wider than it is tall.

   C. No. They face different directions.

   D. Only if they share a vertex.

3. One triangle has sides 3, 4 and 5. Another has sides 6, 8 and 10. Are they congruent?

   A. Yes. Their angles are the same.

   B. Only if they are rotated.

   C. No. No rigid motion can change side lengths.

   D. Yes. Both are right triangles.

4. A translation maps P(0, 0), Q(3, 0), R(0, 4) to P′(2, 1), Q′(5, 1), R′(2, 5). Where does the same translation send (1, 1)?

5. A rigid motion maps A to A′ and B to B′. AB = 2x + 3 and A′B′ = 11. What is x?

6. Which pair of figures can NOT be congruent?

   A. two squares with side 5

   B. two segments of length 2

   C. two 30° angles

   D. two circles with radii 3 and 4

7. A reflection maps angle XYZ, which measures (3x + 10)°, onto angle X′Y′Z′, which measures 70°. What is x?

8. After a rotation, segment AB lies exactly on top of segment CD. What can you conclude?

   A. AB ∥ CD in every case

   B. AB is longer than CD

   C. AB ⊥ CD

   D. AB ≅ CD

9. A rigid motion maps triangle ABC onto triangle DEF. The perimeter of ABC is 27. What is the perimeter of DEF?

10. Which rigid motion maps (2, 3) to (−3, 2)?

    A. a 90° counterclockwise rotation about the origin

    B. a reflection across the y-axis

    C. a 90° clockwise rotation about the origin

    D. a reflection across y = x

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Challenge

Multi-step and word problems that stretch it.

1. Triangle ABC has A(1, 1), B(4, 1), C(1, 3). Triangle GHI has G(1, −1), H(1, −4), I(3, −1). Which rigid motion maps A to G, B to H and C to I?

   A. a reflection across the x-axis

   B. a 90° counterclockwise rotation about the origin

   C. a 90° clockwise rotation about the origin

   D. a translation

2. A rigid motion maps (1, 2) to (4, 2), (1, 5) to (4, 5) and (3, 2) to (6, 2). Where does it map (0, 0)?

3. Two quadrilaterals both have sides 2, 3, 2, 3 in order. Must they be congruent?

   A. Yes. Matching sides always mean congruent.

   B. No. Their angles could be different, like a rectangle and a slanted parallelogram.

   C. No. Quadrilaterals can never be congruent.

   D. Yes, if they are both quadrilaterals.

4. A rotation about the origin maps (5, 0) to (0, 5). What is the angle of rotation, measured counterclockwise?

5. A reflection maps (−2, 4) to (4, −2). What is the slope of the line of reflection?

6. Figure F′ is the image of F after a reflection across a line followed by a translation parallel to that line. Which single rigid motion maps F to F′?

   A. a glide reflection

   B. a rotation

   C. a dilation

   D. There is none.

7. A triangle with area 10 is dilated by a scale factor of 3. What is the area of the image?

8. Explain how to use rigid motions to decide whether two figures are congruent.

9. Segment PQ goes from (1, 1) to (−7, 7). What is its length?

10. Which property is NOT always preserved by a rigid motion?

    A. angle measure

    B. distance

    C. orientation (clockwise order of vertices)

    D. area